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DUST SEPARATION -- IMPORTANT ELEMENT OF ENVIRONMENTAL PROTECTION
[Entstaubung -- Wichtiges Element des Umweltschutzes]

by

Pö

Published in Wasser, Luft und Betrieb [Water, Air and Industry], Vol. 17, No. 10, 1973, pp. 355-358.

From the environmental viewpoint, two essential areas of dust separation are distinguished; keeping the atmosphere free of dust, and keeping dust out of the air breathed by the workers in shops, factories, and other places. In connection with atmospheric dust removal, fundamental statements were made in the article "Dust removal and combustion" in this journal (3/73) with the determination that only on the broadest international plane can real air purity be guaranteed and that for this purpose, appropriate warning and reading devices must be employed on just as broad a basis.

No less important is clear air on the job. In turn, the latter must not place any additional burdens on the atmosphere. The necessity of carefully ventilating all rooms in which people wait or work, production areas and storerooms for goods and materials, garages, halls and other closed structures continually raises new problems for those responsible for planning, installing,

and using the required facilities and devices. Accordingly, the number of possible solutions also grows. Ventilation engineering has made substantial progress in recent decades, and is quite capable of fulfilling all requirements with respect to the reliability and effectiveness of the systems and their individual parts. On the other hand, the planning and operation managers of any concern must constantly be familiar with the latest developments, because only then can be completely master the problems arising in this sector. Courses of instruction, such as the training program of the Association of German Engineers (VDI), also show that this information, including the practical applications, can be viewed as necessary.

Hence, in introduction, we may observe that Siemens has come out with an "Environment" information system, involving a concept of a measuring and planning information system for environmental measures. This provides an integrated solution for planning and information distribution in problems of environmental protection and space planning. The system's components in measuring and process technology, transmission technology and data processing are already available, so that the study is focused on integrating the environmental measurements into the data processing system of the public administration, and generating concrete proposals for the organization of the system into different administrative and governmental levels. In this new information system, the starting point for systematic monitoring of the environment is to be fully automatic measuring stations, continuously analyzing air and water compositions, particularly in heavily polluted areas, and recording e.g. meteorological data or noise. These results are then collected, passed along, and analyzed at high speed by computers on various levels of a hierarchical structure (see also "Industry and Technology").

Monitoring Ambient Air

Fig. 1 shows a new ambient-air monitoring system developed by Hartmann & Braun, Frankfurt, which is a measuring and control system for parking garages, tunnels, and large garages. The known properties of the toxic carbon monoxide, which forms CO-hemoglobin in the blood, and blocks the transport of vital oxygen, have resulted in the development of this device, as part of environmental-protection problems. As is well known, CO is invisible and can only be detected by appropriately sensitive measuring devices. In the device shown here, which continuously monitors the ambient air, so-called "sniffers" are situated at various locations, and connected with pipes to a Uras measuring system. The Uras gas analyzers operate on the infrared absorption principle, and determine the CO concentration in seconds with great accuracy. Various upper limits can be set in the system itself. When such a limit is reached, an alarm panel may light up and a ventilation mechanism can be started. When another limit is reached, the contact for a siren is automatically triggered, signaling acute danger of poisoning. Naturally, these ambient-air monitoring systems also record a decrease in CO concentration and automatically cancel the appropriate warning signal.

The portable, automatic measuring and alarm unit for combustible gases and vapors in the air is shown in Fig. 2. It was developed by Drägerwerk Lübeck. It is extremely uncomplicated and reliable, and makes it possible to monitor the air at high-explosion-risk sites in the chemical industry, in dye and lacquer factories, refineries, in the iron and steel industry, in manholes and local drainage facilities. This device also makes it extremely simple to examine tanks and pipes containing combustible gases and vapors for leaks. When the device is used for job-site air monitoring, it will give a

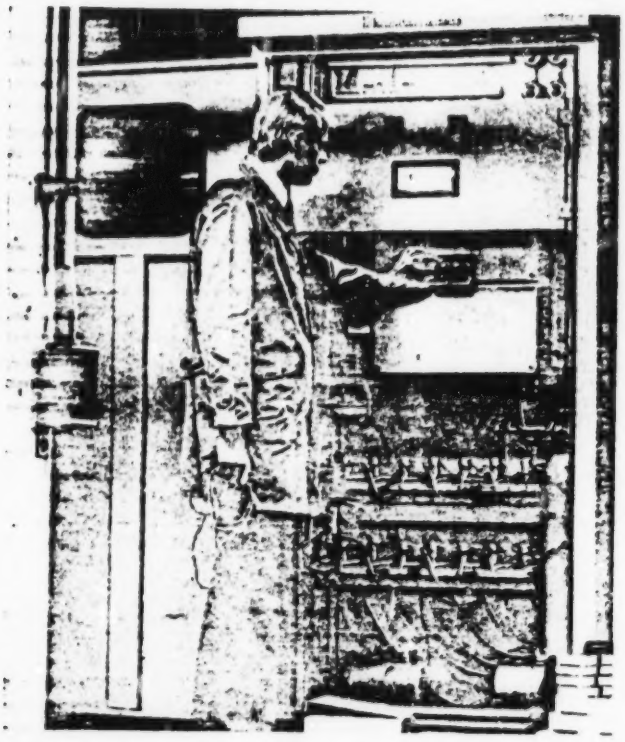

Fig. 1. Control cabinet for large-area monitoring.

reliable warning without any additional operating personnel, since it runs automatically for 10 h.

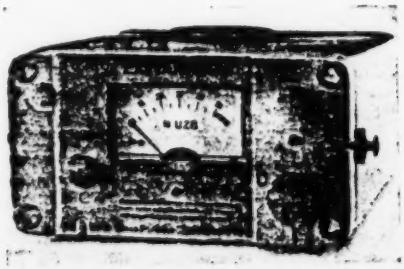

Fig. 2. Portable measuring and warning unit. Exwarn G 1.

The handling of the Exwarn G 1 unit is extremely simple. It is switched on before entering the high-risk area. As it is switched on, it will have to pass through the "test" switch position, i.e. the functional readiness of the device can be ascertained. The measurement itself relies on the evolution of heat, i.e. the combustible gases are oxidized at a catalyst, and the heat of reaction is measured by a change in resistance in a measuring element. The reading is shown in % of the lower ignition limit (UZG). The gas concentration present can also be calculated with the aid of comparison scales. Below the lower ignition limit, there is an adjustable warning threshold, at which an acoustic and optical warning will automatically be triggered. Because of the automatic function of this Exwarn G 1 device, its maintenance is also extremely simple. Its sturdy construction also provides excellent protection against mechanical defects.

The same company has made a measuring, warning, and control unit -- called CO-meter AK2 -- to monitor CO concentration. The unit measures in the hygienic range, with particular operating reliability embodied in the measuring principle, since the device also operates on the basis of heat evolution. A built-in diaphragm pump sucks in the samples from the measuring site. The carbon monoxide (CO) in this air reacts with atmospheric oxygen in a thermostabilized measuring chamber to form CO_2. The heat of reaction can be measured with the aid of a thermobattery. The thermoelectric voltage is amplified and read out via a control display, which has two switch contacts arbitrarily adjustable on the scale.

Industrial Dust

To monitor toxic and silicogenic dusts in the sense of the MAK [maximum place-of-work concentrations] provisions, industry itself must more and more

frequently make appropriate measurements at places of work. For this purpose, Sartorius-Membranfilter, Göttingen has built the so-called Portikon. It was developed by the Dust Research Institute of the Principal Association of Business Societies e.V. in Bonn. This SM 16714 device concentrates the dust on mechanical filters. The Portikon is a portable, battery-driven dust-collecting device, which can also be hooked up to the electrical system, can be used directly at the place of work, and can be carried during work. This makes it possible to make appropriate direct measurements of the air inhaled by employees. This is even possible when there are large spatial and temporal changes in concentration, and even if the samples are to be taken at different locations during the measuring period. The latter case can occur in industrial-hygiene studies during the course of work. The airspeed at the filter is equal to the mean airspeed during inhalation through the nose. Fig. 3 shows a schematic of the device. The diagram shows that the basic equipment consists of a sampling device with an intake hose, the latter being a flexible steel tube, a power cable, a harness with a strap, and a travel box with additional compartments for batteries or a power pack. In the operation of the device, a high-speed blower (I) sucks the dusty air through a mechanical filter. The filter holder (II) is attached to the intake nozzle of the blower by a flexible tube (III). The tube makes it possible to bring the filter head into the desired position. On the side of the device from which air escapes, there is a flowmeter (IV), which is a vane-wheel counter delivering a signal proportional to the throughput, the signal then being sent to the display unit. The entire throughput in m^3 can be read off the meter (V). Depending on the type of operation desired, a rechargeable set of batteries or a power pack is inserted into the plug-in opening of the device.

The specimens can be taken on fiberglass filters or on Mikrosorban filters.

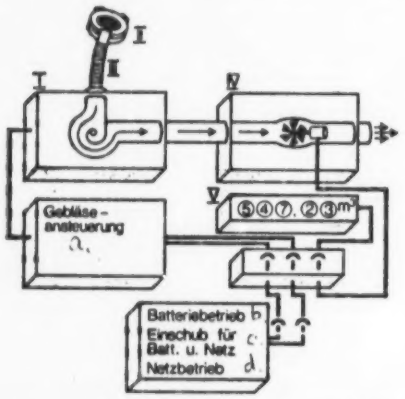

Fig. 3. "Portikon" dust collector.

Key: a. Blower control; b. Battery operation; c. Plug-in unit for battery and power pack; c. Power-pack operation

Air-Conditioning Equipment

Dust removal can be one of the functions of air conditioners. Behind the air entry, replaceable dry-layer filters remove 95% of the dust with grain diameters around 3 μm. These data refer to the cabinet air conditioner System Weiss, Giessen, in which the dry-layer air filters are arranged so that both the circulating air and the outer air are filtered. In devices of this design, all components are situated in space saving fashion in a galvanized steel-plate housing with an acoustically insulating lining. One version of each output stage is for direct hookup to a duct without an air inlet box, while all others are equipped optionally for duct hookup or direct blowout or provided with blowout boxes. In versions with humidification systems, the vapor humidifier is off to the side, outside the device. The required control, operation, and regulatory units are readily accessible on the device, or housed in a separate switchbox.

The Oz 800 air conditioner from Akklimat, Gerlingen, cleans, humidifies, and dehumidifies the air and cools or heats a room. This wall or floor device with a movable stand is shown in Fig. 4. As far as air purification, it is turned on with a switch labeled A, causing the white control lamp to light up, and causing the device to draw room air through an electrostatic dust filter (I) at its back and to expel it forward through the air exit F free of dust and dirt. The switch (B), when turned on, illuminates a yellow control lamp, turning on the active-oxygen device in the interior of the system, which produces a strong antibacterial effect on the purified air passing through. Cold pure water is added through the water inlet H. The volume of the tank is about 10 ℓ. When the switch C is thrown, a green control lamp lits up, as long as switch A has also been actuated, while switch B can be thrown as well if simultaneous air purification by active oxygen is desired. This combination of switch positions leads excessively dry room air through a wet filter built into the interior of the device and brings the air to a constant humidity. Switch C is not operated if a specific air dehumidification is desired. However, the heating system (D) can be switched on for faster action.

This construction shows that the device draws room air through an electrostatic filter and first cleans it of dust and dirt. After this preliminary cleaning, the air passes through a wet filter and an active-oxygen system, where it is cleaned of residual dirt particles. Furthermore, the active-oxygen system oxidizes the odorous substances in the air. The air now returning to the room is free of dust and dirt particles and of odors. The built-in water tank constantly moistens the wet filter, so that the air passing constantly through this wet filter and the airflow are automatically humidified. To draw off gases and dust in welding and grinding, Concordia,

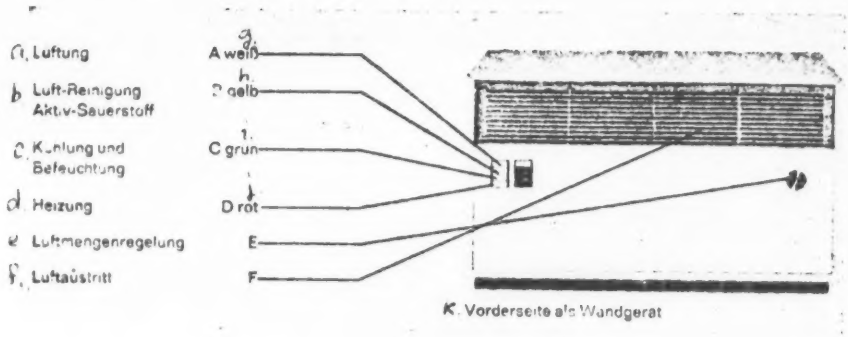

Fig. 4. Purification of air in the air conditioner Oz 800.

Key:
a. Ventilation
b. Purification of air with active oxygen
c. Cooling and humidification
d. Heating
e. Airflow control
f. Air exit
g. White
h. Yellow
i. Green
j. Red
k. Front side of device placed against wall

of Stuttgart has designed the so-called Airmover, which, together with the Atomizer, Strip-Airmover, and Airmiser, constitutes a line of equipment. This line is not yet complete, as indicated by the newness of these devices. They draw a small amount of air from the compressed-air network and generate a much larger volume of air expelled at roughly the ambient pressure. The higher the intake pressure, the larger the volume of air expelled. Fig. 5 shows the Airmover AM 125 V4F from Series 819. The devices are available in nominal widths between 10 and 125 mm.

The Type AT Atomizer uses compressed air and a spraying head to spray liquids for cooling or lubrication. The Strip-Airmover St is used for transporting or guiding foils and strips, and is available in widths of

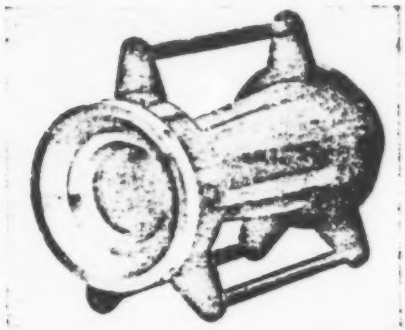

Fig. 5. Airmover AM 125 V4F.

150, 500, and 600 mm. The Airmiser AS fits on every air or spray gun with a narrow thread up to 1/8". The device delivers about 10 times as much air with a correspondingly reduced air consumption and substantial noise damping.

As previously stated, to maintain the purity of the atmosphere, it is necessary that the impurities extracted from the air of rooms of all types and sizes not be returned to the atmosphere. This is particularly critical in large facilities, such as in various industrial operations and heating plants. It is well known that legislators have applied specific taxes in this area. Recent investigations have shown that air pollution is not at all an exclusive responsibility of industry. Moreover, it is important to know at the outset the identity and quantity of pollutants in exhaust gases. For instance, Kühnel, Vienna, has put out a smoke density meter, the individual parts of which are shown in Fig. 6.

In addition to measuring smoke density, these devices also measure the concentration of foreign substances in air or gases, measure visibility in tunnels and monitor the satisfactory function of filter systems. The device is based on the photoelectric measuring technique. A lamp fed by a constant-current source together with an optical system generates a telecentric light

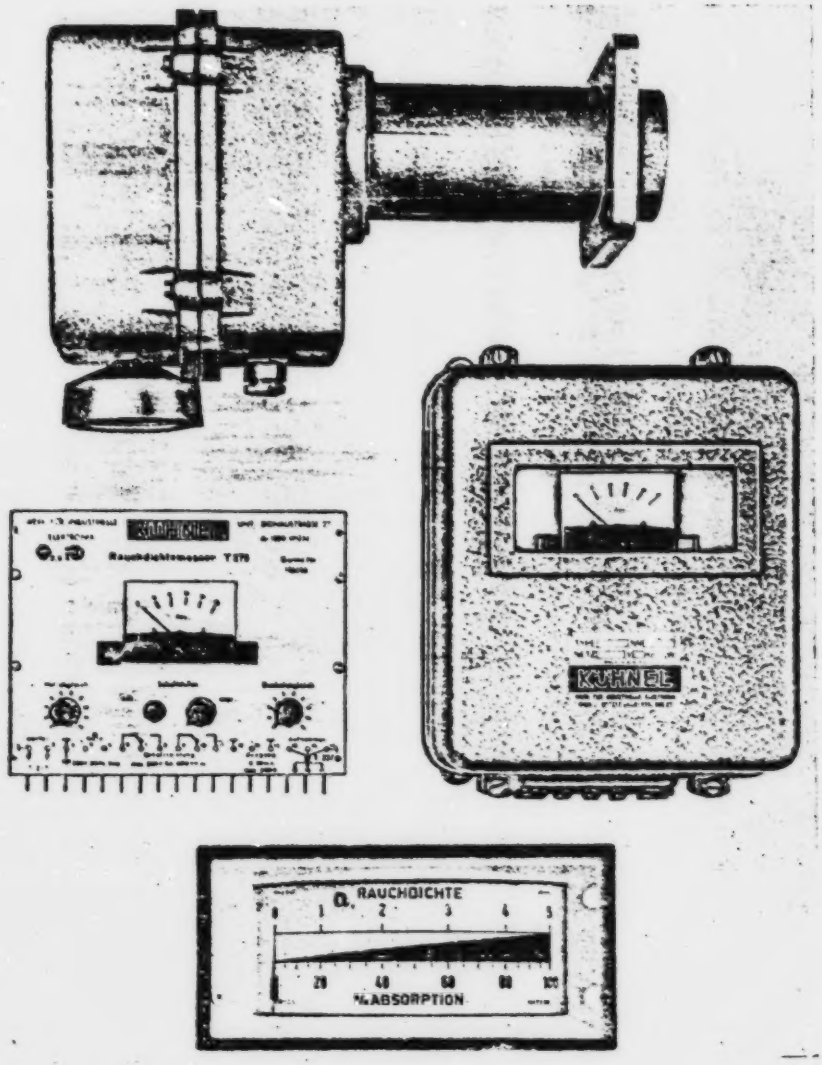

Fig. 6. Smoke density meter.

Key: a. Smoke density

beam, which is more or less attenuated by absorption in crossing a measuring interval at most 7 m long. The transmitted light is converted to a proportional photoelectric current by a light collector. These small currents are amplified linearly to the generally customary starting value of 20 mA. Switch amplifiers permit signal, control, or regulatory functions at specific

adjustable absorption values. The reading accuracy of this device is ±5%, assuming a variation of ±10% in network voltage, a variation in temperature of -10°C to +60°C for the lamp and the light collector and 0 to 40°C for the amplifier. This device intended mainly for environmental protection is also necessary for economic reasons, since smoke is unburned carbon in the exhausts, and each kilogram of unburned carbon means a loss of 8000 thermal units.

Garbage Burning

Problems occur not only in "normal", but also in special fires for garbage burning. The gaseous combustion residues leave the incinerator at a temperature of about 900 to 950°C, as determined by measurements made by the firm Dürr, Ratingen, on garbage-burning plants. Since these residues also carry along flue dusts, they must be cleaned before being expelled through the stack into the atmosphere. The dust limits established by legislative action generally require the use of electrostatic smoke gas filters. Mechanical filters can be used only when the dust-content requirements on the exhausts are less stringent. If a smoke gas filter is to be used, the temperature of the gases must be between 300 and 350°C. Since the actual temperature in the incinerator is higher, the temperature must be reduced e.g. by water, cold air, or steam generators. In garbage burning, the best results so far have been obtained with grate fires, which were developed specially for burning low-quality fuels. This includes the "Düsseldorf System" roller grate developed by Dürr.

Picture credits: Hartmann & Braun, Frankfurt; Drägerwerk, Lübeck; Sartorius, Göttingen; Akklimat A. Engster, Gerlingen; Concordia, Stuttgart; Kühnel, Vienna.

BIO-DETERGENTS: NO HARMFUL EFFECTS
[Bio-Waschmittel: Keine schädliche Wirkung]

by

[No author given]

Published in Wasser, Luft und Betrieb [Water, Air and Industry], Vol. 17, No. 10, 1973, p. 358.

Enzyme detergents -- the so-called bio-detergents -- do not endanger the health of the user. This is stated by the scientific director of the Federal Health Office, Dr. Fritz Griepentrog, in an article in Bundesgesundheitsblatt. Independent experiments, the experiments of other German, English, and American scientists, and clinical observations and questionnaires have not discovered any differences in human tolerances for enzyme-free and enzyme-containing detergents.

For many months, enzymes in detergents were the object of public criticism. Throughout the world, enzymes in detergents were alleged to be a potential hazard to the health of the user. Although the manufacturers of enzyme detergents -- both in West Germany and in other countries -- could point to comprehensive studies and tests demonstrating the safety of the enzyme detergents, the critics did not believe them. Meanwhile, studies carried out

by the most various official and neutral institutions in the world have clearly shown that the users of enzyme detergents are not exposed to any health risks.

During manufacture, the enzymes are in the form of a very fine powder. In the initial phase, this produced diseases of the respiratory organs and allergic skin reactions in workers of the manufacturing plants. These initial difficulties were very rapidly eliminated by installing dust-type systems, fully automatic control of production, and by the use of protective clothing. The conditions under which the enzymes are produced can in no way be compared with those under which the consumer uses the enzyme detergents. The enzyme component of a bio-detergent is less than 1% and is diluted even further in the wash water. Furthermore, the enzyme is embedded in other detergent ingredients, and present only in bound form.

In large-scale tests, which English scientists conducted under intensified practical conditions, more than 4000 housewives were given enzyme detergents, to be used for all cleaning work in the house. An enzyme-free detergent was as a control substance. Both products were given out in neutral packaging. Dermatological studies could find no differences in the effects of the two types of product on the skin. No detrimental reactions were observed. Skin eruptions due to contact with clothes washed in enzyme detergents were not found either. The American Food and Drug Administration did not observe any harmful effects of detergent enzymes on the skin in studies on more than 11,000 housewives over a period of 2 to 4 weeks. Studies on 3000 housewives over 8 weeks and on several hundred infants whose diapers had been washed in enzyme detergents came to the same result. These and a large number of other studies clearly showed: enzyme detergents do not constitute a health danger for the consumers. Unfortunately, these discoveries have not been publicized

with nearly the same intensity as the previous critical attacks against bio-detergents.